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ABSTRACT

This research is, in part, a study of a method of differentiating between two different types of retardation (the exogenous or brain injured and the endogenous or non-brain injured). However, this paper is also an example of the evaluation of a research problem, for it incorporates data and information from three different studies, each of which leads to the next study. The first study concerned the establishment of a profile of abilities of the retarded child as measured by the Wechsler Intelligence Scale for Children (WISC). The Vocabulary and Arithmetic subtests were found to be significantly low, while the Picture Completion, Object Assembly and Similarities subtests were significantly higher than the mean. A followup study was done to determine the causes for the extreme scores found in the previous study. A tentative conclusion was that the brain injured child contributed more variability to the subtest scores than did the non-brain injured. More indications of brain injury and a lower correlation between intelligence and achievement was found for the hypothesized exogenous group. The final study (presently in the proposal stage) will attempt to show the differences which exist between the exogenous and the endogenous mental defective as measured by the WISC. (Author)

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THE USE OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN IN DIFFERENTIATING BETWEEN THE ENDOGENOUS AND EXOGENOUS MENTAL DEFECTIVE

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Abstract:

Much research has been done in the area of mental retardation. However, because the majority of special education programs have attempted to use nearly the same teaching methods for all retarded children, very little research has been done in the area of differential diagnosis of the various types of retardation. This paper is, in part, a study of a method of differentiating between two different types of retardation (the exogenous or brain injured and the endogenous or non-brain injured). However, this paper is also an example of the evolution of a research problem, for it incorporates data and information from three different studies, each of which leads to the next study.

The first study concerned the establishment of a profile of abilities of the retarded child as measured by the Wechsler Intelligence Scale for Children (WISC). One hundred retarded children were randomly selected for the study. The mean scaled score for each of the eleven subtests of the WISC (omitting Mazes) were found. The Vocabulary and Arithmetic subtests were found to be significantly lower than the mean scaled score for the entire population, while the Picture Completion, Object Assembly and Similarities subtests were significantly higher than the mean.

A followup study was done to determine the causes for the extreme scores on the WISC as found in the previous study. From an investigation of the variance of the subtest scaled scores, two groups of children were further studied. One group, labeled as high variability, showed six times the rate of brain injury as the low variability group. Furthermore, the low variability group yielded a higher correlation coefficient (+.77) between I.Q. and achievement than the high variability group (+.41). Although this difference was not significant at the .05 level, it served to point out some differences between mentally retarded children. A tentative conclusion from this study was that the high variability group contained a high percentage of exogenous (brain injured) children, thus accounting for the high indication of brain injury and the low correlation between I.Q. and achievement. The low variance group appeared to be composed mostly of endogenous defectives (non-brain injured). However, this conclusion demanded a more thoroughly controlled study to be substantiated.

The final study is currently in the proposal stage. This study will attempt to show the differences which exist between the endogenous and exogenous mental defectives as measured by the WISC. Tentative hypotheses are that the exogenous retardates will score higher than the endogenous defectives on the verbal tasks of the WISC, while the endogenous child will show superior skills on tasks requiring memory, visual perception, visual-motor ability and other nonverbal skills. Furthermore, the exogenous child should

show more intertest and intratest variability than does the endogenous child.

Thus, it is felt that there exists significant differences between the exogenous and endogenous mental defective which supports the conclusion that there is a need to develop two separate teaching methods and educational programs, including separate classrooms, for the endogenous and exogenous mental defectives.

STUDY # 1: TEST PATTERNS OF MENTALLY HANDICAPPED CHILDREN ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Problem: The main purpose of this research is to determine if a specific pattern of scores exists for children diagnosed as mentally handicapped. According to a previous study done by Gallagher and Lucito (1961) some definite patterns of scores on the Wechsler Intelligence Scale for Children were found. Using the population of a previous study as well as test scores found by other researchers, they found the Vocabulary, Information and Arithmetic subtests generally low for mentally retarded children; while high scores were found on the Picture Completion and Object Assembly subtests. As can be seen, retardates do poorer on the abstract, verbal sections than on the more concrete, non-verbal subtests. No specific pattern of scores was found for children of average intelligence.

Method: Four groups of 100 test protocols each were randomly selected from existing psychological reports of the Special Education Department, Kalamazoo Public Schools. All children were referred for testing because of learning problems. There were 277 boys and 123 girls comprising the entire group. A further breakdown shows 201 (50%) male whites, 76 (19%) male blacks, 76 (19%) female whites and 47 (12%) female blacks. The range of age was from 5 to 15 years with a mean age of 9.76. Average intelligence using the WISC was: Verbal I.Q. 79, Performance I.Q. 79, and Full Scale I.Q. 77.

The four groups were divided according to the following

classification:

Group	Verbal, Performance & Full Scale I.Q.
Group 1 (mentally defective)	I.Q. below 70
Group 2 (borderline)	I.Q. 70 - 79
Group 3 (dull normal)	I.Q. 80 - 89
Group 4 (average)	I.Q. 90 - 119

The scaled scores for each of the regularly administered eleven subtests of the WISC were totaled for each group. Means for each subtest were found. T-tests were run between each of the eleven subtests and the mean subtest score for each group to determine if certain subtests deviated significantly from the mean and thus develop a pattern of scores for that group.

Results:

TABLE 1

MEAN SCALED SCORES

	Group 1	Group 2	Group 3	Group 4
Information	4.13	5.56	6.76	8.76
Comprehension	4.27	6.01	7.74	9.62
Arithmetic	3.57	5.74	7.14	8.71
Similarities	4.59	6.97	8.37	10.21
Vocabulary	3.31	5.18	6.72	8.88
Digit Span	3.94	6.70	7.92	9.47
Verbal Subtotal	23.81	36.16	44.65	55.65
Picture Completion	5.21	7.02	8.33	10.24
Picture Arrangement	3.95	6.19	7.67	9.49

Table 1 continued:

	Group 1	Group 2	Group 3	Group 4
Block Design	4.40	6.52	7.89	9.76
Object Assembly	4.87	7.06	7.71	9.69
Coding	4.00	5.88	7.36	9.23
Performance Subtotal	22.43	32.67	38.96	48.41
Total	46.24	68.83	83.61	104.06
Mean	4.20	6.26	7.60	9.46
Median	4.15	6.12	7.59	9.37

TABLE 2

T TLST (mean vs subtest score)

	Group 1	Group 2	Group 3	Group 4
Information	-0.37	-3.68**	-4.20**	-3.04**
Comprehension	+0.37	-1.32	+0.70	+0.70
Arithmetic	-3.32**	-2.63**	-2.30*	-3.26**
Similarities	+2.05*	+3.74**	+3.67**	+3.26**
Vocabulary	-4.68**	-5.68**	-4.40**	-2.52**
Digit Span	-1.37	+0.63	+1.52	+0.04
Picture Completion	+9.63**	+4.00**	+3.65**	+3.39**
Picture Arrangement	-1.32	-0.37	+0.35	+0.13
Block Design	+1.05	+1.37	+1.45	+1.30
Object Assembly	+3.35**	+4.21**	+0.55	+1.00
Coding	-1.05	-2.00*	-1.14	-0.96

Table 2 continued:

** sign at the .01 level (2.326)

* sign at the .05 level (1.64)

Discussion: The results as shown in Table 2 indicate a definite pattern of scores for children of mentally handicapped intelligence. Picture Completion is primarily the highest score on the test protocols of these children. The Object Assembly subtest also deviates significantly above the mean. The Vocabulary and Arithmetic subtests fall below the mean. A fifth subtest, Similarities, shows tendencies toward deviation above the mean. As can be seen, the subtests which deviate below the mean are the most abstract, verbal and academically oriented subtests, while the two deviating above the mean are concrete, non-verbal and non-academically oriented. The Similarities subtest appears out of order with the above profile for the retarded. However, further analysis shows that many of the children who scored high on this subtest were able to do so by use of functional and concrete approaches rather than using abstract concepts. Furthermore, this subtest at the lower level does not measure similarities or verbal concept formation, but instead measures analogies at a simple level. Therefore, the relatively high scores on Similarities represents the level of concrete verbal abilities in mentally retarded children.

Because Group 1 (mental defectives) and Group 2 (borderline defectives) do not differ a great deal in intellectual level, it is not surprising to see many similarities between the profiles of Groups 1 and 2. In fact, there are six significant deviations,

positive and negative, from the average score for the children of Group 2. Of these six deviations, five of them directly correspond to the deviating scores of the first group. The additional deviation occurs on the Information subtest, another verbal, academic oriented subtest. This subtest likewise deviates below the mean scores.

The fact that Groups 3 and 4 have many of the same deviations as the other groups does not help establish an individual pattern of abilities and disabilities for the mentally defective. However, it is felt that the population of mentally retarded children in this study is a typical sample, while the population of children with average intelligence is considered to be highly atypical. This group is a clinical population of non-learners. They are children who are unable to learn under normal classroom situations.

Summary: The basic purpose of this research is to help establish a profile of subtest scores on the WISC for mentally handicapped children. A profile was established which found relatively high scores in the more non-verbal, concrete and non-academic subtests (Picture Completion and Object Assembly) and relatively low scores on certain verbal, abstract and academic oriented subtests (Vocabulary and Arithmetic). A similar profile was found for borderline retarded children which was felt to reflect their retardation and accumulation of varying degrees of disabilities. The profile for the "average" children unfortunately indicates their disabilities in the area of academic learning and does not show a true profile of abilities for children of average intelligence.

STUDY # 2: A COMPARISON OF MENTALLY HANDICAPPED CHILDREN WHO EXHIBIT HIGH OR LOW VARIABILITY OF THE SUBTESTS ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Problem: The main purpose of this research is to determine if mentally retarded children who differ in the amounts of variability on the Wechsler Intelligence Scale for Children also differ on other test measures. In a previous study, the author established a profile of abilities for the mentally retarded child as tested by the WISC. This research showed the retarded child to be highest on the non-verbal, concrete, non-academic subtests of the WISC (Picture Completion and Object Assembly) and lowest on the verbal, abstract and academic oriented subtests (Vocabulary and Arithmetic).

Upon examination of the data of this study, it was found that some subjects had a very even profile of scores on the WISC, while others had marked deviations. It was hypothesized that the subjects whose WISC profiles were even would differ from the subjects with many deviations on measures of brain injury and achievement.

Method: A group of 100 subjects from a previous study was used. Using the WISC protocol for each of these subjects the variability, in the form of the standard deviation of subtest scores, was computed. The mean standard deviation for this group was computed at 14.44 with a S.D. of 4.22. The subjects were then separated into three groups: group one consisted of the subjects with high variability (one standard deviation above the mean), group two consisted of those subjects with a low amount of variability (one

standard deviation below the mean), while group three consisted of the subjects with an average amount of variability (plus or minus one standard deviation from the mean). Group one consisted of 19 subjects as did group two. Group three (N=62) was not used in this study.

Medical records of the subjects of groups one and two were thoroughly checked for evidence of medical diagnosis of brain injury. No statistical tests were used to compare the incidence of brain injury between these two groups. Only the total of such incidences were tallied.

Each of the subjects was also given the Wide Range Achievement Test (WRAT). Only 18 of the subjects of group one and 17 subjects of group two were available for testing. The mean standard scores (S.S.) of the Spelling, Arithmetic and Reading sections of the WRAT were treated as an Achievement Quotient (A.Q.) and compared with the I.Q. score of each subject. A Pearson Product-Moment Correlation Coefficient was found for each group with a z test run between the correlation coefficients.

Results:

Incidence of brain injury in case history:

Group one (high variability)	6 cases
Group two (low variability)	1 case

Correlation coefficient between achievement (A.Q.) and intelligence (I.Q.):

	Group one	Group two
No	18	17
Mean I.Q.	59.17	57.41

	Group one	Group two
Mean A.Q.	65.24	67.53
r =	+.41	+.77

z = 1.58 (Not significant at .05 level*)

* a value of 1.96 was needed for significance at the .05 level

Discussion: As can be seen from the previous results, group one (high variability) had six incidences of brain injury out of 19 subjects, while group two (low variability) had only one case out of 19. Although this is not considered significant evidence, it is felt that it is at least indicating a trend. That is, it appears that more brain injured children were contained in grop one than in group two.

Also, from the above results, group two had a higher correlation between intelligence and achievement (+.77) than did group two (+.41). Although the difference between these two correlation coefficients is not statistically significant, it is felt that this difference points to an important educational trend. That is, group two appears to be achieving closer to their ability than group one.

Summary: The purpose of this study is to determine if a group of 19 subjects who showed little variability on the WISC would differ on other measures from a group of 19 subjects with high variability. A check through the complete medical histories of the subjects revealed six cases of brain injury in group one (high variability), but only one case in group two (low variability). Furthermore, a correlation coefficient of +.77 was found for

group two when intelligence and achievement were compared. Group one showed a correlation of only +.41, thus indicating that group two was achieving closer to their ability than was group one.

A tentative hypothesis is that group one achieved at a lower rate because of a higher occurance of brain injury. Furthermore, since group one had high variability between the subtests of the WISC, a high medical incidence of brain injury in their case histories and a low level of achievement when compared with intelligence, it is, therefore, hypothesized that group one consisted primarily of brain-injured retarded children (exogenous). Also, it is hypothesized that group two consisted primarily of non brain injured (endogenous) mental defectives. However, further research is needed to substantiate these hypotheses.

STUDY # 3: THE USE OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN IN DIFFERENTIATING BETWEEN THE ENDOGENOUS AND EXOGENOUS MENTAL DEFECTIVE

Introduction: Proposed Dissertation Study For many years, special education programs for the educable mentally retarded have attempted to use similar teaching methods for all retarded children. These methods were aimed at helping the non-brain injured retardates and advocated the use of a large variety of learning experiences with a high level of stimulation (Kirk, 1963, pp. 120-121; Frankel et al, 1966, pp. 9-11.) The main concern of the educator has been to differentiate between the retarded and the non retarded child with secondary concern given to the classification of trainable and educable retardation. Little or no concern has been devoted to further differentiation within the group of E.M.R. children.

Statement of the problem: The problem to be investigated in this research is to identify those measured skills contained within the Wechsler Intelligence Scale for Children (WISC) which will differentiate the endogenous type mental defective from the exogenous retardate.

Rationale: The need for devising a method of differential diagnosis for the mentally retarded is to enable the educator to more effectively group these exceptional children for the purpose of instruction. Historically, it has been assumed that E.M.R. children composed a homogenous group by virtue of having

homogenous I.Q. scores. However, there has been some evidence (Martinson and Strauss, 1940) that indicated that the exogenous (brain-injured) retardate requires a different educational program from the endogenous (non-brain-injured) mental defective. In their study, Martinson and Strauss (1940) found the endogenous child to be very slow in learning new behaviors and new tasks, but very able to work on the same task for long periods of time. The exogenous type children were found to be lacking in the skills of attention. They were more disorganized, incoherent and distractable than the endogenous child. Therefore, from past experience, it has been evident that there is a need for two types of programs for the mentally retarded. However, the current trend is for a single grouping of educable mentally retarded children for purposes of educational instruction.

It is felt that the main reasons for homogenous grouping of educable mental retardates have been the lack of adequate organization to provide two separate programs for retarded children and the lack of adequate instruments and methods of differentiating between the two groups of mental defectives. It is also felt that the former is the easier to remediate.

Since a medical diagnosis has been required in the past for making a discrimination between the endogenous and the exogenous mental defective, most educational institutions have found it difficult to finance such a program of diagnostics. However, many school systems employ specialists, such as educational, school or clinical psychologists who are qualified to use a large number of test instruments and to make certain educational and/or psychological diagnoses. The psychologist employed in the

school should be capable of differentiating between the endogenous and exogenous type mental defective. It is also felt that with proper use, any number of test instruments would be valid for use as described above. However, because of the range of abilities tested and its widespread use and familiarity, the Wechsler Intelligence Scale for Children (WISC) was chosen for this study. The method of differential diagnosis is the remaining problem to be investigated in this study.

Definition of terms:

1. Endogenous mental defective: A medical diagnosis has shown: (1) the presence of mental deficiency among the members of the immediate family, (2) the absence of significant factors in the birth and developmental history, according to the case record, and (3) the absence of neurological signs of each of these subjects.

2. Exogenous mental defective: Each subject in this classification has been medically diagnosed as having: (1) no evidence of mental deficiency in the members of the immediate family, (2) a history of pre-natal, natal or post-natal injury to the brain, either of a traumatic nature or due to an inflammatory process, or (3) the presence of neurological signs of brain lesion. These definitions are similar to those used by Frazeur and Hoakley (1947).

3. Strauss treatment method: According to Martinson and Strauss (1940), the exogenous child requires a treatment program which utilizes a variety of approaches, such that the most proper approach can be used depending upon the pattern of damage resulting from the organic defect.

4. Traditional treatment method: Martinson and Strauss (1940)

also state that the endogenous child learns at a much slower rate than does the normal child. Therefore, it is necessary to train the child intensively, using carefully selected materials, but with a very basic method. Since most programs view the retarded child as if he were of the endogenous type and prepare his program as such, the method of teaching the endogenous child will be considered as the traditional treatment method.

Limitations of this study: This study is faced with the limitations caused by the definitions of the endogenous and the exogenous type mental defective. By using a medical approach for differentiating between the endogenous and the exogenous types of deficiency, certain inconsistencies of diagnosis will be present. For example, parental pressure could affect the final diagnosis, thereby causing an artificial increase in the number of brain-injured (exogenous) retardates. Furthermore, there exists considerable variability of competency for such a diagnosis within the medical profession.

Methods The WISC protocol of two hundred subjects were separated into two groups, the endogenous and the exogenous mental defective. The results of each of the eleven subtests of the WISC were used for each group. The scaled scores of each of the following subtests were used: Information, Comprehension, Arithmetic, Similarities, Vocabulary, Digit Span, Picture Completion, Picture Arrangement, Block Design, Object Assembly and Coding. Certain subtests scaled scores were combined to yield composite scores measuring common traits. The scaled scores of the following subtests were added

to yield a single score measuring a specific trait: Information and Picture Completion (alertness); Comprehension and Picture Arrangement (comprehension of social situations); Similarities and Block Design (concept formation); Information, Comprehension, Similarities and Vocabulary (verbal comprehension); Block Design, Object Assembly and Coding (visual-motor organization); and Arithmetic, Digit Span and Coding (concentration).

T-tests were run comparing the two groups on each of these six measures. Differences were considered significant at the .01 level. The following hypotheses were tested using these data:

Hypothesis 1: There are no differences between the endogenous and exogenous child as measured by the total of the verbal comprehension subtests of the WISC. (Information, Comprehension, Similarities, and Vocabulary.)

Hypothesis 2: There are no differences between the endogenous and the exogenous as measured by the total of the visual-motor organization cluster of the WISC (Block Design, Object Assembly, and Coding subtests).

Hypothesis 3: There are no differences between the endogenous and the exogenous as measured by the total of the Information and Picture Completion subtests of the WISC (alertness cluster).

Hypothesis 4: There are no differences between the endogenous and the exogenous as measured by the total of the Comprehension and Picture Arrangement subtests of the WISC (comprehension of social situations.

Hypothesis 5: There are no differences between the endogenous and the exogenous as measured by the total of the similarities and Block Design subtests of the WISC (concept formation).

Hypothesis 6: There are no differences between the endogenous and the exogenous as measured by the total of Arithmetic, Digit Span and Coding subtests of the WISC (Concentration).

The verbal I.Q. and the performance I.Q. of each subject was used for the next part of the study. The difference between the Verbal I.Q. and the Performance I.Q. of each subject was computed by subtracting the Performance I.Q. from the Verbal I.Q. A t-test was run comparing the two groups of subjects on this measure of the difference between verbal and nonverbal abilities. Significance again was sought at the .01 level. The following hypothesis was tested using these data.

Hypothesis 7: There are no differences between the endogenous and the exogenous as measured by the difference between the Verbal I.Q. and the Performance I.Q. of the WISC (VIQ - PIQ).

The variance of the scaled scores for the eleven subtests of the WISC were computed for each subject. The value of the variance was used as an index of intratest variability. A t-test was run comparing the two groups on this measure. A .01 level of significance was sought. The following hypothesis was tested using these data:

Hypothesis 8: There are no differences between the endogenous and the exogenous as measured by an index of intratest variability of the WISC.

Lastly, a measure of intertest variability was computed for each subject. Each time a subject completed a difficult problem or answered a difficult item after he had previously failed an easier one (scored as zero) one point was tabulated. This was done with all of the subtests except Digit Span and Coding. For

the Digit Span subtest, an inconsistency was scored when the subject passed an item on the second attempt after failing the first. No measure of inconsistency was attempted for the Coding subtest. If a subject passed two or more items in succession after failing the easier item, a score of only one point was counted. Only the inconsistencies of failures were scored and summed for the measure of intertest variability. A t-test was then run comparing the endogenous and the exogenous groups. A .01 level of significance was sought. The following hypothesis was tested using these data:

Hypothesis 9: There are no differences between the endogenous and the exogenous as measured by an index of the total intertest variability of the WISC.

Expected Results: In summary of the previous studies dealing with endogenous and exogenous mental defectives, it appears that the endogenous-exogenous classifications can be differentiated according to the following: the endogenous child has been found to be superior to the exogenous child on tasks requiring concept formation, visual perception, visual-motor ability, memory and other nonverbal skills. The exogenous defective appears to be generally superior to the endogenous child on verbal tasks. The exogenous child also appears to be more alert and more sociable. Furthermore, the exogenous child should show considerable more intertest and intra-test variability than does the endogenous child.

Relating to the present study using the WISC, the literature review suggests that the endogenous child should be superior to the exogenous on those subtests measuring concept formation (Similarities

plus Block Design) and visual motor organization (Block Design, Object Assembly and Coding). The exogenous child should prove to be superior on those subtests measuring verbal comprehension (Information, Comprehension, Similarities and Vocabulary); and alertness (Information, and Picture Completion) and comprehension of social situations (Comprehension and Picture Arrangement). Furthermore, the difference between the Verbal I.Q. and the Performance I.Q. should also indicate the verbal superiority of the exogenous group. Lastly, the exogenous group should also show greater intertest and intratest variability than the endogenous group.

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